

# Developing solid Earth modeling and simulation capabilities for future gravity satellite missions

Completed Technology Project (2014 - 2016)



## Project Introduction

This project will demonstrate innovative solid Earth science applications of future measurements from gravity gradiometers and laser inter-satellite tracking by numerical simulation of gravity recovery. We will define and assess groundbreaking research opportunities only possible with these highly capable instruments for advancing understanding of earthquakes, tsunamis, and postglacial rebound. We will develop modeling and simulation tools quantifying the temporal and spatial nature of the solid Earth deformation, which are especially needed for optimal processing of the sensitive time-variable gravity measurements from future space missions, GRACE Follow-On (to be launched in 2017) and GRACE-II (anticipated in 2020-2030).

### Description and Objectives:

- Develop modeling and simulation capabilities of the temporal and spatial response of the solid Earth to earthquakes (EQ), tsunamis, and post-glacial rebound (PGR).
- Need to optimize improved time-variable gravity measurements from future space missions including GRACE Follow-On (FO), to be launched in 2017, and GRACE-II (anticipated in 2020-2030) to address compelling solid Earth Applications.

### Key challenge(s)/Innovation:

- Lack of suitable simulation/modeling tools inhibit solid Earth applications of gravity measurements from highly-capable instruments such as laser-tracking and gravity gradiometer.
- Development of novel approaches to utilization of present and future gravity satellite missions for the solid Earth applications.

### Approach:

Simulation & modeling of gravity change from GRACE FO and GRACE I/II for:

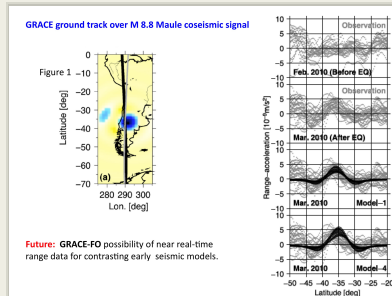
1. Earthquake related (preseismic, coseismic, postseismic) processes. Provide "earthquake-correction product" for climate and hydrological investigations.
2. Real-time constraints on tsunami wave propagation
3. Solid Earth response to ice mass changes. PGR corrections for ICESat I/II.

## Anticipated Benefits

GRACE

GRACE Follow-On

GRACE II



Earth modeling and simulation capabilities for future gravity satellite missions

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### Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Goddard Space Flight Center (GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland

### Primary U.S. Work Locations

Maryland

### Organizational Responsibility

#### Responsible Mission Directorate:

Mission Support Directorate (MSD)

#### Lead Center / Facility:

Goddard Space Flight Center (GSFC)

#### Responsible Program:

Center Independent Research & Development: GSFC IRAD

### Project Management

#### Program Manager:

Peter M Hughes

#### Project Manager:

Matthew J McGill

#### Principal Investigator:

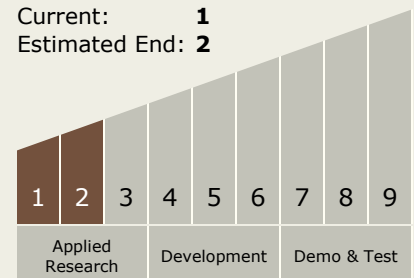
Jeanne M Sauber-rosenberg

### Technology Maturity (TRL)

Start: **1**

Current: **1**

Estimated End: **2**

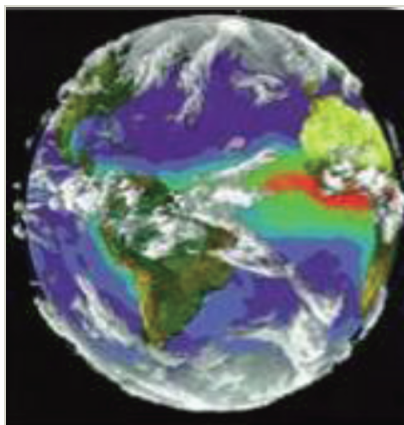


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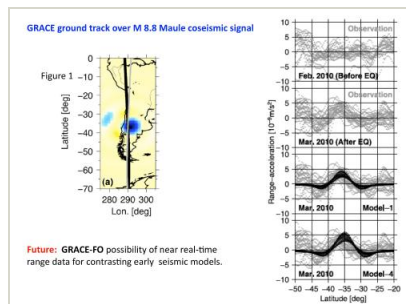


## Images



### Earth modeling and simulation

Earth modeling and simulation  
(<https://techport.nasa.gov/image/20733>)



### Earth modeling and simulation capabilities for future gravity satellite missions

Earth modeling and simulation capabilities for future gravity satellite missions  
(<https://techport.nasa.gov/image/20735>)

## Project Website:

<http://sciences.gsfc.nasa.gov/sed/>

## Technology Areas

### Primary:

- TX01 Propulsion Systems
  - └ TX01.1 Chemical Space Propulsion
  - └ TX01.1.4 Solids